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AUTHOR Calhoun, Mary Lynne
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ABSTRACT

Investigated was the effectiveness of three techniques - lecture, written presentation, and modeling via videotape - in teaching task analysis skills to 64 elementary school teachers enrolled in graduate special education courses. Ss participated in one of the three treatment groups or a control group, and were administered two response measures: a 30 - item multiple choice questionnaire on task analysis information and a seven-scene videotape analogue which assessed the use of task analysis skills in classroom situations. Lecture and modeling produced significantly higher scores on both response measures than did no training, while written presentation failed to produce scores significantly superior to no training. Results indicated that task analysis skill is best acquired in small, interactive group situations. (CL)

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TEACHING TASK ANALYSIS SKILLS TO TEACHERS: A COMPARISON OF THREE METHODS

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by

Mary Lynne Calhoun

Assistant Professor

Department of Special Education

Winthrop College

Rock Hill, South Carolina

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INTRODUCTION

An important trend in special education is that of mainstreaming, the movement to transfer some handicapped children from special classes to regular classes. Mainstreaming has the effect of requiring general educators to assume at least partial responsibility for the education of handicapped children, a responsibility that was once the province of special educators alone. This new responsibility has placed new demands on general educators, and there is a recognized need to provide general educators with new skills with which to deal with the population they are now serving.

The field of teacher training in special education, then, is itself serving a broader population: general educators are participating in special education workshops, in-service sessions, and graduate courses in order to learn skills that will help them deal effectively with the handicapped children in their care. There is a need to analyze and identify specific skill components and teacher behaviors which are necessary in the education of handicapped learners and then to teach these skills to teachers.

One component skill that has been identified as being useful in the teaching of handicapped children is that of task analysis. The key to successful mainstreaming, say Beery (1971), is individualization of instruction in regular classrooms, and the key to individualization is creation of a process for identifying what each child knows and needs to learn. Task analysis is seen as the process for making that identification. Junkala (1974)

calls task analysis a major element in the larger movement to individualize instruction. Most efforts toward individualization, Junkala (1974) continues, seem to focus on looking for the "right materials to use with children who have learning problems, on the presumption that the materials, once found, will provide the answers to instructional problems. A much more helpful approach is task analysis because task analysis identifies the demands that a task will make on a child and will therefore allow the child to meet each demand. This is a broad solution to the problem of individualizing instruction because it gives a teacher the ability to look closely at materials and methods she intends to use with a given pupil in a given situation. With more precise knowledge of what a task demands, teachers can more effectively choose instructional alternatives that are appropriate for a given situation. Frank (1973) calls the taking of learning tasks and breaking them down into small, sequential steps "one of the simplest ways to sharpen classroom performance" and to become a better educator.

What are Task Analysis Skills?

While expressions of the utility and benefits of task analysis skills for teachers are not uncommon, it is clear that the term "task analysis" does not have a universally accepted meaning. There are at least two basic approaches to task analysis: the behavioral approach and the analysis of task presentation and response.

The behavioral approach ties task analysis very closely to the setting of instructional objectives. Task analysis is defined as the identification of the sequential steps or tasks through which the learner must progress in order to get from the observed behavior to the particular instructional ob-

jective. Bateman (1967) describes this approach as one that places relatively little emphasis on discovering abilities or disabilities within the child but places major emphasis on the educational tasks to be taught. Bateman (1971) defines task analysis as "the process of isolating, describing and sequencing as necessary, all the necessary subtasks which when the child has mastered them, will enable him to perform the objective."

The second approach to task analysis, the analysis of task presentation and response, has been suggested by Doris Johnson (1967). Two aspects of the task the child is expected to accomplish are analyzed: the manner of the presentation of the task and the expected mode of response. These aspects are considered in relationship to the child's success or failure in performing the task. Johnson (1967) suggests a number of ways in which a task might be analyzed: perceptual channels, single sensory-perceptual system or a cross-modal shifting, verbal or non-verbal, social or non-social judgments, what skills and levels of involvement are required. If a child fails a task, the teacher analyzes whether failure is due to the mode of presentation or the mode of response expected and probes for the factor that accounts for the failure.

In spite of certain differences in emphasis, there are certain common elements in the descriptions of task analysis skills that could possibly be quite useful to teachers.

Breaking Down a Task into Component Parts

First, there is emphasis on the skill of breaking down a learning task into its major and significant component parts. Bateman (1971) describes this job as an exercise of logic: the teacher draws on reason, experts, curriculum guides, past experience with teaching related skills,

knowledge of how children respond and perform in classrooms. The crucial questions that are asked in analyzing a task are whether subskills are necessary and whether they are sufficient to enable the successful completion of the task, and the answers come from a logical evaluation of the task.

Frank (1973) suggests that the first step is to state clearly what the learning task is. The second step is to list all the prerequisite skills that are necessary to meet the objective. It may be easiest at this point, Frank (1973) suggests, to brainstorm the steps or operations without regard to the sequence in which they were taught. After this list is completed, then attention should be given to placing the steps into a logical teaching sequence.

This task analysis skill could reflect both major approaches to task analysis if the list of major and significant component parts included what kind of response the child is required to make. For example, if the child is required to write a word from memory, spell a word orally, or choose a correctly spelled word from four written choices, this requirement should be included in the task analysis.

Error Analysis

A second common element in task analysis descriptions is a focus on a child's failures or errors. In a task analysis framework, a child's errors are viewed in a constructive way. The message seems to be this: there are reasons for errors; look closely at errors and look for patterns of errors. From error patterns, it may be possible to identify which component parts of a task the child has not yet mastered. A clinical teacher never simply counts up the number of right and number of wrong responses but looks instead at

errors as clues to what the child still needs to learn.

Instructional Decisions

Finally, a third common element in descriptions of task analysis skills for teachers is the idea that task analysis permits teachers to choose alternatives to the instructional approach that has just failed.

Junkala (1974) comments that "through the ability to present a carefully worded, pre-analyzed task, the teacher is able to look at the child's successes and failures and immediately choose alternatives to the instructional approach that has just been tried." Alternatives include changing the complexity of the task (focusing on component parts of the task that are not yet mastered), changing the amount of material, or changing the kind of response demanded from the child.

Definition of Task Analysis

Task analysis skills can be defined, then, as the ability to break down a learning task logically into its necessary and sufficient component parts, the ability to analyze a child's patterns of error in order to determine elements of a task that are not yet mastered, and finally, the ability to choose instructional alternatives based on a child's successes and failures in a learning situation.

Teaching Task Analysis Skills to Teachers

Task analysis is viewed, then, as a set of helpful skills for teachers who need to individualize instruction. An appropriate question is whether these skills can be easily learned by teachers. While there are written guides available for writing performance objectives and doing task analysis and these guides are deemed useful, a systematic investigation of the teaching of these

skills to teachers has not been carried out.

Beyond the question of whether task analysis skills can be taught effectively to teachers is this: are some ways of teaching these skills more effective than others? As in other fields of teacher training, special education is undergoing significant changes. There is increasing emphasis on improving the quality of teacher-training process and product. Teacher preparation programs are increasingly being held accountable for their methods, and attention is being focused on effective ways of teaching important skills.

This study investigated the relative efficacy of three techniques - lecture, written presentation, and modeling via videotape - in teaching task analysis skills to teachers.

METHOD

Subjects

Subjects were 64 elementary school teachers who were taking graduate courses in special education. They were part of a group of 80 teachers from three Southern school districts who were participating in a project designed to facilitate mainstreaming. Each subject had responsibility for at least one mildly handicapped child in her classroom, and each volunteered to participate in the mainstreaming project. All were teaching in rural school districts.

Subjects ranged in age from 22 to 58 years; the median age was 29. Years of teaching experience ranged from 1 to 32; the median number of years of teaching experience was 4.

Table 1 summarizes the classroom assignments of the subjects by grade level or subject matter. The sample consisted of 62 females and 2 males.

Table 1

Classroom Assignments of Subjects by

Grade Level or Subject Matter

Classroom Assignment	Number
Kindergarten	1
First grade	9
Second grade	7
Third grade	10
Fourth grade	8
Fifth grade	12
Sixth grade	6
Physical education	2
Math specialist	4
Reading specialist	2
Diagnostic-prescriptive teacher	2
Guidance counselor	1

Response Measures

Two response measures were used.

A probable first step in a teacher's effective use of task analysis skills is acquiring an adequate knowledge of the important components of task analysis. The first measure, then, was a 30-item multiple choice questionnaire covering all aspects of the task analysis information presented in the treatment conditions. Ten questions were drawn from the information presented on each of the three task analysis subskills: the ability to break down a learn task logically into its necessary and sufficient component parts; the ability to analyze a child's patterns of error in order to determine elements of a task that are not yet mastered; and the ability to choose instructional alternatives based on a child's successes and failures in a learning situation. The questions were drawn from material on task analysis currently used in the field of special education.

A reliability measure was obtained on this questionnaire. A Kuder-Richardson 20 reliability coefficient of .76 was found for the present population.

Appendix A gives the questions and answer key for the multiple choice questionnaire (Response Measure 1).

In addition to acquiring knowledge about task analysis skills, teachers must be able to generalize a knowledge of this procedure to real life situations which call for decision-making. The second response measure was a 7-scene videotape analogue which was developed to assess the ability of teachers to use task analysis skills in classroom situations. Each scene consisted of an elementary school child making a mistake in the classroom. Content areas included arithmetic, spelling and reading.

After each scene, the teachers were asked to respond to two questions about the scene; (1) What is the error pattern? (2) If you were the teacher, what skill would you work on? There were therefore 14 items on the second response measure.

Subjects had 90 seconds to respond to both of the two questions for each scene. The analogue was designed to encourage an immediate response to situations involving children with learning difficulties which might be encountered in the classroom.

Because the written responses on Response Measure 2 were subjective in nature, a scoring manual was developed to provide guidelines for judging the appropriateness of the responses. The manual consisted of several examples of correct and incorrect responses to each of the 14 items. Examples were drawn from the responses of a group of 30 teachers with whom these materials were pilot tested.

Two assistants were trained in the scoring procedure, and they evaluated responses independently.

The percentage of agreement on all items scored was 90%. An inter-rater reliability coefficient (Pearson r) of .88 was attained.

Treatment Instruments

A pamphlet was constructed to provide information about task analysis skills for teachers and how these skills can be used in individualizing instruction. Task analysis skills described in the pamphlet were breaking down a task into its component parts, analysis of error patterns, and how to use this information to choose instructional alternatives. Several examples of each skill were included. Practice questions which could be self-checked were included at the end of each section.

The text of the pamphlet was used to prepare the lecture on task analysis skills. The order of presentation of the material was identical to that in the pamphlet as was the content of the examples. The practice questions were included in the lecture.

A videotape was produced to show teachers using the same task analysis skills. The videotape segments corresponded to the examples that appear in each section of the pamphlet. The component skill of breaking down a task into its component parts was illustrated by a group of young teachers working together on this skill. The component skills of error analysis and choosing instructional alternatives were illustrated by a teacher and young children.

Procedure

Three treatment conditions, designed to teach identical information about task analysis, were limited to approximately 60 minutes for presentation of the particular treatment and 30-40 minutes for completion of the two response measures.

The classroom teachers participated in the study as part of a day-long workshop on "Materials and Methods for Individualizing Instruction." The workshop was held on a college campus, and the teachers were released from their classroom responsibilities for that day. As the teachers registered for the conference, they were randomly assigned to one of four groups, each composed of 16 persons. The groups were then randomly assigned to one of three treatment conditions or a control condition.

Written presentation group

The teachers were given the task analysis pamphlet and were asked to read the pamphlet carefully at their own speed, to try to answer the practice questions, and to check their answers in the back of the pamphlet. The teachers

were then given the multiple choice questionnaire, followed by the videotape measure.

The instructions for the multiple choice questionnaire were as follows: "Now you will have the opportunity to apply what you have just learned about task analysis. Please read each of these 30 questions carefully and choose the one best answer. Be sure to answer every question."

The instructions for the videotape response measure were as follows: "You will now see seven short scenes involving children experiencing difficulty in school. Please watch each scene carefully. At the end of each scene, you will have 90 seconds to respond to the two questions about that scene on your answer sheet."

Lecture presentation group

Using the lecture outline derived from the task analysis pamphlet, the experimenter covered the task analysis topics in one lecture. The practice questions were asked by the lecturer. One response from an individual in the group was taken by the lecturer and feedback regarding the correctness of the response was given.

Following the presentation, the response measures were administered.

Modeling presentation group

The same lecture outline was used. Each set of behaviors described by the lecturer was modeled by teachers and children on videotape. Practice questions were handled in a manner similar to that in the lecture presentation. Response measures were administered in the standard manner.

Control group

Teachers in this group observed a demonstration of some teaching materials

and then were asked to complete the response measures. The directions to this group were as follows: "For research purposes I am going to ask you to complete two instruments. These are a multiple choice questionnaire and a videotape response instrument, both of which will ask you some questions about task analysis. I know you haven't studied this material. Please answer all questions in the way you think makes the best sense to you. Thank you."

The teachers in the control group were given the task analysis pamphlets at the end of the session and were encouraged to study the pamphlet. They were told that they would have the opportunity to ask questions about task analysis at a future class session.

Dependent Variables

Dependent variables were performance scores on the written questionnaire and videotape analogue response measures.

RESULTS

An analysis of variance performed on the 30-item task analysis questionnaire (Response Measure 1) showed a significant difference between groups ($F=7.28$, $df=3/60$, $p<.01$). The results of the analysis are presented in Table 2. As eta of .52 idicated that approximately 27% of the variation in test scores is accounted for by knowing by which method the task analysis skills were presented.

The range, mean, and standard deviation of scores for Response Measure 1 is presented in Table 3.

The results of Duncan's test indicated that both the lecture and modeling groups were significantly superior ($p<.01$) to the control group. There was no significant difference between the written presentation group and the

control group.

The lecture presentation group was significantly superior ($p<.05$) to the written presentation group. There were no other significant differences between groups.

The results on Duncan's test are summarized in Table 4.

An analysis of variance performed on the 14-item videotape analogue response measure (Response Measure 2) showed a significant difference between groups ($F=13.75$, $df=3/60$, $p<.01$). The results of the analysis are presented in Table 5. An eta of .64 indicates that approximately 41% of the variation in test scores is accounted for by knowing by which method the task analysis skills were presented.

The range, mean, and standard deviation of scores on Response Measure 2 is presented in Table 6.

The results of Duncan's test indicated that both the lecture and modeling presentation groups were significantly superior ($p<.01$) to the control group. The lecture and modeling presentation groups were also significantly superior ($p<.01$) to the written presentation group. There were no other significant differences between groups.

The results of Duncan's test are summarized in Table 7.

DISCUSSION

The discussion will deal with these issues: First, the question of whether task analysis skills can be taught effectively to teachers; second- a discussion of differences in teaching methods; third, how this information might be used in the development of a module for teaching task analysis skills. Finally, directions for future research will be discussed.

Table 3

Range, Mean, and Standard Deviation for

Response Measure 1 Scores for

Each of the Four Experimental Conditions

Method of Presentation	Range	M	SD
Written Presentation	13-28	21.31	4.40
Lecture Presentation	22-28	24.81	2.03
Modeling Presentation	16-27	24.00	3.34
Control	9-25	19.31	4.68

Table 4

Duncan's Test

Response Measure 1

$\bar{X}_4$	$\bar{X}_1$	$\bar{X}_3$	$\bar{X}_2$
19.31	21.31	24.00	24.81
	2.00	4.69**	5.50***
		2.69	3.50*
			.81

*** p<.01, df=3/60

** p<.01, df=2/60

* p<.05, df=2/60

$\bar{X}_1$= written presentation

$\bar{X}_2$= lecture presentation

$\bar{X}_3$= modeling presentation

$\bar{X}_4$= control

Table 5

Analysis of Variance of Response Measure 2 Scores

Source	S.S.	df	MS	F
Between Groups	184.42	3	61.47	13.75*
Within Groups	268.31	60	4.47	
Total	452.73			

* $p < .01$, $df = 3/60$

Table 6

Range, Mean, and Standard Deviation for

Response Measure 2 Scores for

Each of the Four Experimental Conditions

Method of Presentation	Range	M	SD
Written Presentation	3-12	8.25	2.22
Lecture Presentation	9-13	11.31	1.31
Modeling Presentation	7-13	10.69	1.68
Control	2-11	7.19	2.70

Table 7

Duncan's Test

Response Measure 2

$\bar{X}_4$	$\bar{X}_1$	$\bar{X}_3$	$\bar{X}_2$
7.19	8.25	10.69	11.31
	1.06	3.50**	4.12***
		2.44*	3.06**
			.62

*** $p < .01$, df=3/60

** $p < .01$, df=2/60

* $p < .01$, df=1/60

$\bar{X}_1$= written presentation

$\bar{X}_2$= lecture presentation

$\bar{X}_3$= modeling presentation

$\bar{X}_4$= control

Can Task Analysis Skills Be Effectively Taught to Teachers?

The answer to this question must be a qualified yes. Differences in scores were similar on both response measures, the multiple choice questionnaire and the videotape analogue measure. Two methods of presentation, lecture and modeling, produced significantly higher scores ($p < .01$) than did no training. On the multiple choice questionnaire, the lecture group scored significantly higher ($p < .05$) than the written presentation group. On the videotape analogue response measure, both the lecture and modeling groups scored significantly higher ($p < .01$) than the written presentation group. It would seem, therefore, that task analysis skills which have been described as an important part of the clinical teacher's repertoire can be included practically in teacher education programs.

Differences in Teaching Methods

The method of presentation which did not produce significantly higher scores than no training was that of written presentation. Teachers in this group were given self-instructional written material to read at their own pace. The fact that this group failed to achieve scores significantly superior to a no-training group has important implications for the development of competency-based teacher-education programs in special education. Competency-based implies that the knowledge and skills gained by way of a module must be observable and demonstrable (May, 1972).

As in other fields of teacher education, competency-based instruction is becoming an increasingly important development (Shores, 1973; Schwartz & Oseroff, 1972). One hallmark of competency-based programs is the use of self-paced instructional packages (Getz et al., 1973). Teacher-preparation programs are restructured so that large group, classroom lecture activity

is held to a minimum, and students proceed, with the help of advisors, through self-paced modules. These modules often rely heavily on the written presentation of material. The effective use of such material would seem to depend on a degree of literacy and "mission-oriented behavior" that may not always be present. An additional concern that has been expressed about the self-paced modules is that students may be isolated from each other and from professors and that this isolation could limit learning (Houston & Howson, 1972). The present results would support the expressions of caution regarding written presentation modules. The written presentation method was not successful in teaching task analysis skills to teachers. It is quite possible that other objectives of the curriculum are not best met through a self-paced, written learning experience.

As Houston & Howson (1972) point out, some competencies are in all likelihood best acquired in small, interactive group situations. It would seem that task analysis is one of these competencies. Both the lecture and modeling presentations, which involved some group interaction, produced greater scores ($p < .01$) on both response measures than the no-training condition. The lecture presentation group was superior also to the written presentation group on both response measures; on the analogue response measure, the modeling group was also superior to the written presentation group.

The two successful presentations, lecture and modeling, are similar in that they both involved group problem-solving activities and that they made use of what Bandura (1971) calls "verbal modeling" or instruction. Verbal modeling involves instigating the person to respond and describing the requisite behaviors and the manner in which they are to be executed. The

modeling condition differed from the lecture condition in that it contained additional modeling: videotape "symbolic modeling" episodes.

The modeling condition did not produce higher scores than the lecture condition on either response measure.

It may be that modeling would be more useful in teaching task analysis skills in a microteaching context. Microteaching involves the cycle of presenting information about a skill, showing a model film involving application of the skill, the preparation of a lesson by the trainee, the taping of that lesson with immediate replay, self-evaluation, and re-teaching (Borg et al., 1970). People regulate their actions, suggests Bandura (1971) by self-generated anticipatory and self-evaluative consequences. The microteaching approach makes use of anticipatory and self-evaluative consequences and may therefore strengthen the attentional processes of observers. Modeling in the context of feedback and self-evaluation may have more to offer in teaching task analysis skills than in the present study.

A Task Analysis Module

The question now arises as to the usefulness of the information from this study in the development of a module for teaching task analysis skills to teachers.

The demand is growing, Reynolds (1974) states, for teaching modules that correspond to specific objectives in teacher education. As in other fields of teacher training, there is increased emphasis in special education on improving the quality of teacher training process and product, and there is a trend toward competency-based teacher education (Thiagarajan et al., 1974). A teaching module is a set of experiences intended to facilitate learner demonstration of competencies (Houston, 1973).

There is a priority in special education for sharing ideas and procedures for instructional modules. The Council for Exceptional Children has recently requested that members share teacher education instructional materials that they have developed (Erickson, 1975). Reynolds (1974) points out that the absence of a mass audience does not encourage commercial initiative in a relatively small field such as special education, and that initiative must come from special educators involved in teacher training.

Because this study has indicated that task analysis skills can be taught effectively to teachers and because developmental testing of the teacher materials and response measures has been carried out, it would seem possible to use information from this study to develop a module for teaching task analysis skills to teachers. Material developed which could be used in a task analysis module include the following:

1. a lecture outline with examples for practice and an indication where taped modeling segments could be used appropriately;
2. a videotape of examples of the task analysis skills;
3. a 30-item multiple choice response measure with answer key and a break-down of items into skill categories for error analysis;
4. a 7-segment videotape of analogue classroom situations;
5. a 14-item response measure to accompany the videotape;
6. a scoring manual for the analogue response measure.

Directions for Future Research

The module on task analysis skills developed here could be strengthened by studying the effects of feedback on learning and by developing strategies for reteaching skills not mastered on the first try. The microteaching approach might be useful in the further development of the module

for teaching task analysis skills to teachers.

Even though teachers in this study were able to apply task analysis skills in analogue classroom situations, there is no guarantee, of course, that the skills will be applied in everyday teaching behavior. Self-report measures or observation coding systems by skilled observers may be useful in determining the extent to which a teacher's real-world performance is affected by her knowledge of task analysis skills.

The ultimate criterion for evaluating the effectiveness of task analysis skills is in the facilitation of learning for exceptional children. Looking at children's performance as a result of training by a teacher with task analysis skills is an important area for future research.

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